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## REMARKS

The pending claims in the application are claims 32-36, 38-40, 42, 44, 46-48 and 50-52.

### Request for Rejoinder Renewed

Applicants respectfully request rejoinder of method claims 1-11, 13, 15, 17-19 and 21-31, upon allowance of the product claims 32-36, 38-40, 42, 44, 46-48 and 50-52.<sup>1</sup> To that end, withdrawn method claims 1, 19, 21, 22 and 31 have been amended for consistency with the amended product claims, as further discussed below.

### Claim Amendments/New Claims

Claims 1, 22, 32, and 39 have been amended to recite that  $R_1$  and  $R_2$  may only be  $R^0$  when M is W, Nb, Al or B. In connection with such revision, each of claims 19, 21, 36, 38, 44, and 46 has been amended for consistency with the independent claim from which it depends. Further, claim 31 has been amended to change its dependency, since the presence of titanium silicon nitride can only result from the further addition of a silicon source reagent to the precursors of Claim 1. No new matter (35 USC 132) has been entered, since the claimed subject matter is explicitly supported by the specification and claims as originally filed.

New independent claims 51 and 52 have been added to specifically claim a subset of the subject matter set forth in the prior versions of claims 32 and 39, respectively. These added claims 51 and 52 recite titanium and tantalum precursor compounds including silyl and  $C_1$ - $C_4$  alkyl-substituted silyl groups in which the degree of alkyl substitution on the silicon is mono-substitution or di-substitution, but not tri-substitution. These structures are within the scope of disclosure in the specification as filed. The specification provides that the silyl moieties,  $R^0$ , of which there are three, may be the same or different and each is independently selected from H or  $C_1$ - $C_4$  alkyl. Stated another way, the number of potential silyl moieties disclosed in the specification can be represented by the formula  $H_s(R^*)_{3-s}Si$  in which  $R^*$  is independently a  $C_1$ - $C_4$  alkyl and s is 0, 1, 2 or 3. In claims 51 and 52, applicants have excluded those structures in which s is 0. Thus, no new matter has been added.

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<sup>1</sup> Rejoinder was previously requested in the response to the June 15, 2004 Office Action, filed July 29, 2004, and again is requested in the present response.

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**Claim Objections**

In the October 17, 2005 Office Action, the Examiner objected to claim 46 as depending on cancelled claim 45.

Claim 46 therefore has been amended herein to depend from claim 39, to overcome the objection.

Withdrawal of the objection is respectfully requested in respect of amended claim 46.

**Rejections of Claims and Traversal Thereof****Anticipation by Shapiro et. al.**

In the October 17, 2005 Office Action, claims 32-36, 38-40, 42, 44 and 46 were rejected under 35 U.S.C. §102(b) as being anticipated by Shapiro et.al., with Shapiro et. al. cited as disclosing metalorganic precursors of the formula in the claims.

Applicants respectfully traverse such rejection in light of the amendments made herein to the claims. As a result of the amendments made herein, none of the metalorganic precursors as now recited in claims 32-36, 38-40, 42, 44 and 46 has any derivative basis in the disclosure of Shapiro et. al. Accordingly, applicants respectfully request that the rejection of claims 32-36, 38-40, 42, 44 and 46 be withdrawn.

**Obviousness over Shapiro et. al. in view of Kirlin et. al. and Su et. al.**

In the October 17, 2005 Office Action, claim 42 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Shapiro et. al. in view of Kirlin et. al and further in view of Su et. al. Shapiro et. al. has been cited as disclosing the claimed compounds. Although Shapiro et. al. is acknowledged in the Office Action as being silent with respect to an aluminum component, Kirlin et. al. is said to disclose that titanium aluminum nitride is a desirable barrier layer that can be prepared with metalorganic precursors and Su et. al. has been cited as disclosing the formation of an aluminum nitride barrier using alkylalanes. The Office Action alleges that it would have been obvious to one skilled in the art to have combined the

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disclosures of each of the references because a mixed barrier layer is useful and the precursors taught by Shapiro et. al. and Su et. al. are useful in allowing low temperature deposition of a barrier layer.

Applicants respectfully traverse this ground of rejection.

In light of the amendment of claim 39, from which claim 42 depends, Shapiro et. al. contains no derivative basis for the metalorganic precursors now claimed by applicants, and Shapiro et al. contains no disclosure of any aluminum source reagent. Thus, even if the secondary references were applied in the manner proposed in the Office Action, the combined disclosures of Shapiro et al., Kirlin et al. and Su would still not suggest or motivate the use of the specific metalorganic precursors now claimed, and the hypothetical proposed combination of references would fail to yield a *prima facie* basis for applicant's claimed invention on such basis alone.

Even if such lack of tenable basis for the rejection were ignored, however, the rejection would still fail to present a *prima facie* case for obviousness, since Su et. al. teach a method for the formation of purified aluminum nitride, and not (as contended in the Office Action) the formation of an aluminum nitride barrier layer. Indeed, nothing in Su et. al. suggests that the process therein disclosed could be used for forming an aluminum nitride barrier layer. Su et. al. employ alkylalane compounds in combination with anhydrous ammonia in a precipitation reaction in a suitable solvent following which the precipitate is collected and subjected to pyrolysis to generate the desired high purity aluminum nitride materials.

There is therefore no basis in Su et. al. that would suggest, or from which one would infer, that one could employ such materials in a non-solvent medium, for a non-precipitation reaction, and without precipitate pyrolysis, as would be required if such materials, or even just the alkylalanes thereof, were to be used as proposed by the examiner for vapor deposition of an aluminum nitride or aluminum nitride-containing barrier layer. It is apparent that such extraction of alkylalanes from Su et al. requires arbitrary and wholesale disregard of the express solvent-phase, precipitation and precipitate pyrolysis teachings of Su et al., without any basis or rationale in the reference itself for such extraction.

Thus, as previously noted, Shapiro et. al. contains no teaching or suggestion of any aluminum component. Kirlin et. al. discloses a number of barrier layers including titanium aluminum nitride, N-deficient aluminum nitride, and doped aluminum nitride, and discloses that such barriers may be deposited from metalorganic precursors, but Kirlin et al. does not teach, suggest or motivate the use of

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the particular alane reagents required by applicants' claim 42. Further, Kirlin et al. contains no disclosure, nor does Shapiro et. al., of the use of an aluminum reagent in combination with the metalorganic precursor recited in claim 39, from which claim 42 depends.

Based on all of the foregoing, it is apparent that Shapiro et al., Su et al., and Kirlin et al. cannot in any way be aggregated to yield the subject matter of applicants' claim 42. It therefore is respectfully requested that the rejection of such claim be withdrawn.

**Obviousness over Shapiro et. al. in view of Vaartstra et. al.**

Claim 50 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Shapiro et. al. in view of Vaartstra et. al.

Claim 50 depends from claim 39, as to which it has already pointed out that Shapiro et. al. contains no derivative basis for the metalorganic precursors now claimed by applicants. The proposed hypothetical combination of references therefore fails to present a *prima facie* case on such ground alone.

Thus, there is nothing in Vaartstra et al. that can be combined with Shapiro et al. to yield the metalorganic precursor composition of claim 50, and nothing in Vaartstra et al. suggesting that "borane, decaborane, alkylboranes and amidoboranes" could be combined with specific metalorganic precursors of the present invention to make an effective barrier layer.

In light of the foregoing, it is respectfully requested that the rejection of claim 50 be withdrawn.

**Obviousness over Shapiro et. al. in view of Bhandari et. al. and Muroyama et. al.**

Claims 47 and 48 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shapiro et. al. in view of Bhandari et. al. and Muroyama et. al.

Such rejection is traversed.

Claims 47 and 48 are of dependent form under claim 39. Shapiro et al. has already been shown to lack any basis for the recited metalorganic precursor compounds of amended claim 39. Accordingly, the

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extraction of specific features of Bhandari et al. and Muroyama et al. does not alter the fact that the resulting combination is devoid of the presence of the specific metalorganic precursor compounds of applicants' claimed invention.

The examiner has conceded that "Shapiro et. al. is silent as to an additional silicon source" (page 5, line 6 of the October 17, 2005 Office Action). Given such silence, and the absence of any apparent infirmity in the disclosed compounds or structure of Shapiro et al., why would one of ordinary skill import additional layer structure from Bhandari et al.? The Office Action merely states that "Bhandari et al. discloses that a TiSiN or TaSiN barrier is useful" (page 5, line 7 of the October 17, 2005 Office Action).

Independent utility is not the test of obviousness. It is fundamental §103 law that before prior art references can be combined or modified, there must be some suggestion or motivation found in the art to make the combination or modification. In re Dance, 160 F.3d 1339, 1343 (Fed. Cir. 1998); Heidelberg Druckmaschinen v. Hantscho Commercial, 21 F.3d 1068, 1072 (Fed. Cir. 1994); In re Geiger, 815 F.2d 686, 688 (Fed. Cir. 1987); Lindemann Maschinenfabrik v. Am Hoist and Derrick, 730 F.2d 1452, 1462 (Fed. Cir. 1984). "It is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art, to combine the elements." Arkie Lures, Inc. v. Gene Larew Tackle, Inc., 119 F.3d 953, 957 (Fed. Cir. 1997).

Here there is no motivational basis in Bhandari et al. for the proposed combination, and there is no motivational basis in Shapiro et al. for the proposed combination. The examiner has set out no rationale for why one of ordinary skill would make any modification of Shapiro et al. in light of the existence of Bhandari et al. This is a fatal deficiency in the citation of Bhandari et al. - as the Federal Circuit has clearly stated, it is incumbent on the examiner to establish a factual basis to support the legal conclusion of obviousness. In re Fine, 837 F.2d 1071 (Fed. Cir. 1988).

The citation of Muroyama et al. is likewise unavailing to provide any tenable basis of support for a §103 rejection of claims 47 and 48. Again, no rationale has been set forth in the Office Action as to why one of ordinary skill would in any way seek to combine the disclosure of such reference with the disclosure of Shapiro et al. It is merely stated at page 5 of the Office Action that Muroyama et al. "disclose a precursor with formula (I) in which M is Si and in which R1 and R2 are the same methyl or other alkyl and X is F ... and b is 2...[wherein] ethyl is an alkyl group" (page 5, lines 9-12 of the October 17, 2005 Office Action). This observation fails to state any basis of obviousness of applicants' claimed invention.

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The law is clear in this respect. "It is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art, to combine the elements." *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953, 957 (Fed. Cir. 1997). "[T]he fact that references *could* conceivably be modified or combined is insufficient to meet this criterion. In *re* Rouffet, 149 F.3d 1350, 1357 (Fed. Cir. 1998); In *re* Mills, 916 F.2d 680, 682 (Fed. Cir. 1990)).

It therefore is evident that no *prima facie* basis has been presented for the rejection of claims 47 and 48. For such reason, it is respectfully requested that such rejection be withdrawn.

#### **Added Claims 51 and 52**

Claims 51 and 52 added herein are likewise delineated over the cited references and in form and condition for allowance.

#### **Fees Payable**

Two (2) independent claims have been added herein, increasing the number of independent claims by two, beyond the number for which payment has previously been made in this application. The total number of claims has not been increased beyond the number for which payment previously has been made. Accordingly, an added claims fee in the amount of \$400 is due at this time.

Enclosed is a credit card authorization form directing payment of such added claims fee of \$400 to be charged to the credit card identified in such form.

Authorization also is hereby given to charge any deficiency in applicable fees for this response to Deposit Account No. 08-3284 of Intellectual Property/Technology Law.

#### **CONCLUSION**

Applicants have satisfied all requirements for patentability. The pending claims are free of the art and fully comply with the requirements of 35 U.S.C. §102 and §103. It therefore is requested that Examiner Everhart reconsider the patentability of the pending claims in light of the distinguishing remarks herein,

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and withdraw the rejections made in the October 17, 2005 Office Action, thereby placing the application in condition for allowance. A Notice of Allowance is merited and respectfully requested. In the event that any issues remain, Examiner Everhart is requested to contact the undersigned attorney at (919) 419-9350 to resolve same, so that this application can be passed to issue at an early date.

Respectfully submitted,



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